What can the Occult do for you?
STarlight Attenuation & Reddening Survey of Multiple Occulting Galaxies (STARSMOG)

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Abstract. Interstellar dust is still the dominant uncertainty in Astronomy, limiting precision in e.g., cosmological distance estimates and models of how light is re-processed within a galaxy. When a foreground galaxy serendipitously overlaps a more distant one, the latter backlights the dusty structures in the nearer foreground galaxy. Such an overlapping or occulting galaxy pair can be used to measure the distribution of dust in the closest galaxy with great accuracy. The STARSMOG program uses HST observation of occulting galaxy pairs to accurately map the distribution of dust in foreground galaxies in fine (<100 pc) detail. Furthermore, Integral Field Unit observations of such pairs will map the effective extinction curve in these occulting galaxies, disentangling the role of fine-scale geometry and grain composition on the path of light through a galaxy.

The overlapping galaxy technique promises to deliver a clear understanding of the dust in galaxies: the dust geometry, a probability function of the amount of dimming as a function of galaxy type, its dependence on wavelength, and evolution of all these properties with cosmic time using distant, high-redshift pairs.

Keywords. Keyword1, keyword2, keyword3, etc.
The distribution of extinction values observed in an occulting pair can serve as an attenuation and reddening probability template, $P(A_V)$ and $P(R_V)$ respectively, for a SN Ia in a similar host galaxy as the foreground galaxy and both probability functions serve as a tight statistical constraint on any SED model of a spiral disk.

There are three ways to find overlapping pairs: visual identification (Keel et al. 2013), blended spectra (Holwerda et al. 2007, 2015a), or false close galaxy pairs in a highly complete spectroscopic survey (Robotham et al. 2014). STARMOG targets were selected using all three methods plus a $z < 0.05$ requirement in order to map fine detail: 150 SNAP observations proposed, 49 (to date) executed with WFC3/F606W.

Overlapping galaxies offer the opportunity to map the dust attenuation and reddening in galaxy disks to great accuracy, providing probabilities for future high-precision studies of stellar populations and standard candle distance measurements.

References
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